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(54) Title: A PROCESS OF MATCHING DECOR SECTIONS OF SURFACE PANELS

(57) Abstract: A process for matching decor sections on decorative surface panels wherein a decor web with a repetitive decor pattern is impregnated with a thermosetting resin. The decor web is provided with positioning means, said positioning means being used for guiding the tension of the web during the impregnation procedure thereby guiding the longitudinal expansion of the web. Said web is cut into sheets after the impregnation, said cut being thoroughly positioned in relation to said positioning means. Said sheets are laminated and bonded to each one core layer and at least one support layer selected from the group consisting of: overlay of cellulose impregnated with thermosetting resin and underlay of cellulose impregnated with thermosetting resin wherein a raw board is achieved. The raw board is then cut and trimmed into panels, said cut and trimming being thoroughly positioned in relation to said positioning means.

**A process of matching decor sections of surface panels.**

The present invention relates to a process of matching decor sections of surface panels in bulk production.

Products coated with thermosetting laminates are frequent today. They are foremost used where the demand for abrasion resistance is high, but also where resistance towards different chemicals and moisture is required. As an example of such products floors, floor beadings, table tops, work tops and wall panels can be mentioned.

The thermosetting laminate mostly consists of a number of base sheets with a decor sheet placed closest to the surface. The decor sheet can be provided with a desired decor or pattern. The most frequent patterns usually represent the image of different kinds of wood, or minerals such as marble or granite. The surface of the laminate can be provided with a structure during the laminating procedure which will make the decor more realistic. Press plates with structure or structure foils are frequently used when manufacturing such a laminate. A negative reproduction of the structure in the press plate or the foil will be imprinted into the laminate during the laminating procedure.

Thermosetting laminate are for production cost reasons most often produced in rather large formats which have to be cut into smaller, more user friendly, formats. This will cause some problems as the different steps in the production will affect the format of the decor carrying parts of the thermosetting laminate. This problem will not have any greater effect on decors which are rather uniform in pattern and which has no decor section which needs to be located on a specific location on each board. However, when trying to manufacture more specific and dimension dependant decor patterns, like floor tiles with grouting and blocked wood pattern, the problem becomes almost impossible to overcome without having to introduce very large areas that are to be cut away. The latter will cause a lot of waste of the rather costly laminate.

It has for a long time been a great need to be able to manufacture a decorative thermosetting laminate with a decor pattern which simulates exclusive patterns as life like as the decor reproduced.

According to the present invention the above mentioned needs have been met and a decorative board with a decorative surface with a matching surface structure that overlaps the joints of adjacent boards has been achieved. The invention relates to a process for matching decor sections on decorative surface panels, A decor web

with a repetitive decor pattern is impregnated with a thermosetting resin, the decor web being provided with positioning means. Said positioning means are used for guiding the tension of the web during the impregnation procedure thereby guiding the longitudinal expansion of the web. Said web is cut into sheets after the impregnation, said cut being thoroughly positioned in relation to said positioning means. Said sheets are laminated and bonded to each one core layer and at least one support layer selected from the group consisting of; overlay of cellulose impregnated with thermosetting resin and underlay of cellulose impregnated with thermosetting resin wherein a raw board is achieved. The raw board is cut and trimmed into panels, said cut and trimming being thoroughly positioned in relation to said positioning means.

The decor web is suitably made of cellulose. The average fibre direction of the web is longitudinal and the average fibre direction of the web has an average deviation of less than  $5^{\circ}$  from the web centre line. It is however advantageous if the average fibre direction of the web has an average deviation of less than  $3^{\circ}$  from the web centre line. The average latitudinal wet expansion rate of the web is preferably in the range 1.8 - 2.3%.

The average longitudinal wet expansion rate along the edges of the web is preferably not deviating more than 30% from the average longitudinal wet expansion rate along the centre of the web. The average latitudinal wet expansion rate along the edges of the web is preferably not deviating more than 30% from the average latitudinal wet expansion rate along the centre of the web.

The process is preferably controlled further via means of conditioning the different materials used. Accordingly the decor web is conditioned to a specified temperature and moisture content prior to being provided with decor. The decor is applied on the decor web by means of printing. It is also important that the decor web is allowed to set for a couple of weeks after the paper manufacturing before being printed. The latter is part of the conditioning process. The printed decor web is then advantageously conditioned to a specified temperature and moisture content prior to the impregnation. The decor web is then preferably conditioned to a specified temperature and moisture content prior to the lamination. It is in all steps important that the conditioning process is allowed time enough for the web to set as the rolls normally used are rather large and contains rather large amounts of material.

It is also of some importance to treat the support layer. Accordingly, the support layer is suitably conditioned to a specified temperature and moisture content prior to the impregnation. The support layer is then suitably conditioned to a specified temperature and moisture content prior to the lamination. It is also here important that the conditioning process is allowed time enough for the support layers to set

as the rolls normally used are rather large and contains rather large amounts of material.

Also the core layer may need some attention as it has shown to affect the final result to some extent. The core layer most often consists of a particle board or a fibre board. Accordingly the core layer is suitably conditioned to a specified temperature and moisture content prior to the impregnation. It is also here important that the conditioning process is allowed time enough for the core layer to set as it contains certain amounts of material.

The decor section of the decor that is to be accurately matched on the final boards are accurately arranged in relation to the positioning means of the decor web. These decor sections are arranged so that a number of intended panels forms at least two columns and at least two rows on a raw board.

The overlay is impregnated with thermosetting resin, preferably in the form of melamine-formaldehyde resin. The panels may also contain more than one layer. At least one of the thermosetting resin impregnated overlays, preferably the uppermost one is coated with hard particles, for example silica, aluminium oxide and/or silicon carbide with an average size of 1 - 100  $\mu\text{m}$ , preferably around 5 - 60  $\mu\text{m}$ .

According to one embodiment of the invention the upper side of the decorative surface panels is constituted of a decor layer and a ionomeric polymer.

According to another embodiment of the invention the upper side of the decorative surface is constituted of a decor layer, a ionomeric polymer and hard particles.

According to yet another embodiment of the invention the upper side of the decorative surface panels is constituted of a decor layer impregnated with melamine formaldehyde, a ionomeric polymer, overlay impregnated with melamine formaldehyde and sprinkled with hard particles.

In order to make the decor more realistic, the surface suitably is provided with an embossing with different structure pattern. The pattern is selected from the group consisting of; groups of small oblong indentations, different grades of gloss to flat surface finish, ridges and recesses and combinations thereof.

According to one embodiment of the invention the base layer may consist of a number of conventional dry base layer paper webs or base layer paper sheets which are impregnated with a thermosetting resin. The resin in the uppermost of

these is preferably while the rest of the webs or sheets for example may contain melamine-formaldehyde resin or phenol-formaldehyde resin. The decor paper web or decor paper sheet respectively, is hereby placed on top of the conventional base layer webs or base layer sheets after which the different paper webs or a stack of sheets respectively are continuously or discontinuously laminated together at an elevated pressure and an elevated temperature.

The surface layer of the may suitably include a so called overlay paper, placed on top of the decor paper. The overlay paper is suitably impregnated with melamine-formaldehyde resin. At least one of the thermosetting resin impregnated sheets, preferably the uppermost one is preferably coated with hard particles, for example silica, aluminium oxide and/or silicon carbide with an average size of 1 - 100  $\mu\text{m}$ , preferably around 5 - 60  $\mu\text{m}$ .

The overlay may alternatively be replaced by, or used together with, a layer of ionomeric polymer where the polymer for example is constituted of ethylene-methacrylateacid-copolymer while the ions for example are constituted of sodium, zinc or lithium even though other ionomeric polymers are usable. It is also in this embodiment suitable to utilise hard particles as described above.

The base layer suitably consists of a particle board or a fibre board. Such a base layer may be 5 -20 mm thick.

A board according to the invention may for example be used as a floor board, a wall panel or a ceiling panel. The most popular decor used on floor boards is different kinds of wood as for example oak, birch, beech, ash, cherry, maple, walnut, pine, rosewood, mahogany or ebony. Also minerals like marble, granite, sandstone, soapstone and ceramic materials are popular reproductions. The reproductions are suitably grouped so that they form different installation patterns like inlays, marquetry, tiling, grouting, block pattern and the like which all are intended to form a pattern when a number of boards or panels are joined. The surface structures used for simulating surfaces to match the above materials may comprise narrow oblong indentations in the surface of 0.1 - 1 mm width and 0.1 - 1 mm depth which may simulates pores, and cracks of wood. Wood grain may be simulated by sweeping patterns of indentations of 1 - 25 mm width and 0.1 - 2 mm depth. It is also possible to provide the surface with combinations of gloss and flat surfaces in sections which additionally may be raised or recessed.

**CLAIMS**

1. A process for matching decor sections on decorative surface panels wherein a decor web with a repetitive decor pattern is impregnated with a thermosetting resin, the decor web being provided with positioning means, said positioning means being used for guiding the tension of the web during the impregnation procedure thereby guiding the longitudinal expansion of the web, that said web is cut into sheets after the impregnation, said cut being thoroughly positioned in relation to said positioning means, that said sheets are laminated and bonded to each one core layer and at least one support layer selected from the group consisting of; overlay of cellulose impregnated with thermosetting resin and underlay of cellulose impregnated with thermosetting resin wherein a raw board is achieved, that the raw board is cut and trimmed into panels, said cut and trimming being thoroughly positioned in relation to said positioning means.
2. A process according to claim 1 wherein the decor web is made of cellulose, that the average fibre direction of the web is longitudinal and that the average fibre direction of the web has an average deviation of less than 5° from the web centre line.
3. A process according to claim 1 wherein the decor web is made of cellulose, that the average fibre direction of the web is longitudinal and that the average fibre direction of the web has an average deviation of less than 3° from the web centre line.
4. A process according to claim 1 wherein the decor web is made of cellulose, that the average latitudinal wet expansion rate of the web is in the range 1.8 - 2.3%.
5. A process according to claim 1 wherein the decor web is made of cellulose, that the average longitudinal wet expansion rate along the edges of the web is not deviating more than 30% from the average longitudinal wet expansion rate along the centre of the web.
6. A process according to any of the claims 1 - 5 wherein the decor web is conditioned to a specified temperature and moisture content prior to being provided with decor.
7. A process according to claim 6 wherein the decor is applied on the decor web by means of printing.

8. A process according to any of the claims 1 - 5 wherein the decor web is conditioned to a specified temperature and moisture content prior to the impregnation.
9. A process according to any of the claims 1 - 5 wherein the decor web is conditioned to a specified temperature and moisture content prior to the lamination.
10. A process according to any of the claims 1 - 5 wherein the support layer is conditioned to a specified temperature and moisture content prior to the impregnation.
11. A process according to any of the claims 1 - 5 wherein the support layer is conditioned to a specified temperature and moisture content prior to the lamination.
12. A process according to any of the claims 1 - 5 wherein the core layer is conditioned to a specified temperature and moisture content prior to the impregnation.
13. A process according to claim 1 wherein the decor sections are accurately arranged in relation to the positioning means.
14. A process according to claim 13 wherein the decor sections are arranged so that a number of intended panels forms at least two columns and at least two rows on a raw board.
15. A process according to claim 1 wherein the core layer consists of a particle board or a fibre board.
16. A process according to claim 1 wherein the overlay is impregnated with thermosetting resin, preferably in the form of melamine-formaldehyde resin.
17. A process according to claim 16 wherein at least one of the thermosetting resin impregnated overlays, preferably the uppermost one is coated with hard particles, for example silica, aluminium oxide and/or silicon carbide with an average size of 1 - 100  $\mu\text{m}$ , preferably around 5 - 60  $\mu\text{m}$ .
18. A process according to claim 1 or 17 wherein the upper side of the decorative surface panels is constituted of a decor layer and a ionomeric polymer.
19. A process according to claim 1 or 17 wherein the upper side of the decorative surface panels is constituted of a decor layer, a ionomeric polymer and hard particles.

20. A process according to claim 1 or 17 wherein the upper side of the decorative surface panels is constituted of a decor layer impregnated with melamine formaldehyde, a ionomeric polymer, overlay impregnated with melamine formaldehyde and sprinkled with hard particles.



## INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 03/00115

## A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B32B 27/10, B44C 5/04

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B32B, B44C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI DATA, EPO-INTERNAL

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 9731776 A1 (PERSTORP AB), 4 Sept 1997 (04.09.97), page 3, line 10 - line 17, figure 2, abstract  --	1-20
A	US 4612074 A (SMITH ET AL), 16 Sept 1986 (16.09.86), column 5, line 12 - line 27; column 6, line 10 - line 42, figure 2, abstract  --	1-20
A	US 4704171 A (THOMPSON ET AL), 3 November 1987 (03.11.87), figure 1, abstract  --	1-20

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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**INTERNATIONAL SEARCH REPORT**

International application No.

**PCT/SE 03/00115****C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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Information on patent family members

29/03/03

International application No.

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